

TITLE OF THE INVENTION

RELAY DEVICE, INFORMATION TRANSMISSION DEVICE, AND  
INFORMATION TRANSMISSION METHOD

BACKGROUND OF THE INVENTION

5 [0001]

Field of the Invention

The present invention relates to a relay device, an  
information transmission device, and an information  
transmission method.

10 [0002]

Related Background Art

Distribution of services (information distribution)  
provided through a network can be classified into two types,  
that is, a pull type and a push type. The service  
15 distribution of the pull type is a distribution method by  
which a user requests information through web browsing, file  
downloading or the like (for example, see Non-patent  
Literature 1). On the other hand, the service distribution  
of the push type is a distribution method by which a user  
20 passively receive information through mail distribution or  
the like (for example, see Non-patent Literature 1).  
Because of such a difference in the information distribution  
methods, a network to provide information must be previously  
established in the case of service distribution of the pull  
25 type, while a network to provide information is not  
necessarily previously established in the case of service

distribution of the push type.

[0003]

[Non-patent Literature 1]

5        Satoshi Yamato, "What is push type information  
distribution?: FUNDAMENTAL KNOWLEDGE OF TERMS FOR MOBILE  
DEVICES,                      No.                      79,"                      at  
[http://k-tai.impress.co.jp/cda/article/keyword/0,,8083,](http://k-tai.impress.co.jp/cda/article/keyword/0,,8083,00.html)  
00.html, Feb. 5, 2002, (retrieved on Sep. 12, 2002).

[0004]

10        In case of the push type service distribution, since  
the network to provide information is not necessarily  
previously established, information provision may not be  
successful when an information provider distributes  
information, because the network cannot be established for  
15        some reason. Two methods have been employed to deal with  
this problem of information distribution failure.

[0005]

20        The first method of push type service distribution  
may be used when a client terminal used by the user  
periodically connects to a network to request information  
from the information provider (a service provider), thus  
substantially employing a method of the pull type service  
distribution. The second method is for the service provider  
provides information repeatedly until the information  
25        reaches the client terminal, which means the push type  
service distribution must be done continuously.

[0006]

In the case of the first method, the client terminals need to periodically transmit confirmation messages to the service provider to inquire whether there are undelivered services. Transmitting such confirmation messages increases the users' communication costs, and at the same time becomes a load on the network band. Moreover, the service provider needs to deal with the confirmation messages transmitted from the client terminals, which is unsuitable when there are a large number of such target client terminals. In the case of the second method, since the information needs to be continuously transmitted until all the client terminal have connected to the network, this traffic becomes a load on the network band, and increases the service provider's communication costs.

[0007]

#### SUMMARY OF THE INVENTION

Thus, objects of the present invention are to provide a relay device and an information transmission device, and to provide an information transmission method that can provide push type services suited to a network and a network user.

[0008]

A relay device according to the present invention includes connection detection means for detecting a client terminal that can transmit/receive information through a

network that is in a communicable state with the network.

[0009]

5       The relay device of the present invention detects a  
client terminal that is in a communicable state. Therefore,  
for example, by transmitting notification of such a detection  
to a device such as an information transmission device, the  
information transmission device can transmit undelivered  
information to the client terminal. Thus, the information  
transmission device does not transmit undelivered  
10   information when the client terminal are not in a  
communicable state, and therefore it is possible to avoid  
a situation in which information needs to be continuously  
transmitted until the client terminal connects to the network.  
Moreover, since the client terminal does not need to ask  
15   for the undelivered information to be transmitted, the load  
on the network band is reduced and communication costs  
reduced.

[0010]

20       Furthermore, the relay device of the present invention  
in which the connection detection means acquires  
transmission-related information required to transmit  
information to the client terminal, and the relay device  
further comprises notification transmission means for  
transmitting results from the connection detection means  
25   and the acquired transmission-related information to an  
information transmission device for transmitting

undelivered information to the client terminal. Then, for example, if transmission-related information such as an IP address of the client terminal is obtained and the obtained transmission-related information is outputted to the information transmission device, the undelivered information can be transmitted to the client terminal more efficiently.

[0011]

Furthermore, the relay device of the present invention comprises information transmission means (RD (Relay Device)) for transmitting the undelivered information to the client terminal, provided that the connection detection means detects the client terminal is in a communicable state with the network. Then, the undelivered information will not be transmitted when the client terminal are not in a communicable state. Accordingly, it is possible to avoid continuously transmitting information, until the client terminal connects to the network.

[0012]

Furthermore, the relay device of the present invention in which the information transmission means (RD) selects undelivered information to be transmitted to the client terminal from information stored in transmission information storage means, provided that the connection detection means detects the client terminal is in a communicable state with the network, and transmits the

selected undelivered information to the client terminal.  
Then, for example, if there is undelivered information stored  
as undelivered services in the transmission information  
storage means, it is possible to efficiently transmit the  
5 undelivered information when the client terminal connects  
to the network.

[0013]

Furthermore, the relay device of the present invention  
in which the information transmission means (RD) transmits  
10 the selected undelivered information to the client terminal  
together with other information transmitted to the client  
terminal. If the other information can be transmitted, the  
client terminal is in the communicable state with the network.  
Then, the undelivered information can be transmitted more  
15 efficiently since

[0014]

Furthermore, the relay device of the present invention  
in which the other information transmitted to the client  
terminal is information transmitted/received by use of HTTP;  
20 and the information transmission means (RD) adds the selected  
undelivered information by changing the HTTP header of the  
other information transmitted to the client terminal, and  
transmits the selected undelivered information to the client  
terminal. Then, the undelivered information can be  
25 transmitted to the client terminal together with the other  
information by so-called a piggyback system. Thus, it is

possible to transmit the undelivered information to the client terminal more simply.

[0015]

Furthermore, the relay device of the present invention in which the information transmission means (RD) transmits the selected undelivered information to the client terminal separately from the other information transmitted to the client terminal. Then, the undelivered information can be transmitted at an appropriate. For example, when a mobile phone as the client terminal is used to make a call, the connection detection means detects the call and enables to transmit mail information as undelivered information to the mobile phone separately from the voice information.

[0016]

The information transmission device of the present invention includes notification reception means for receiving notification concerning detection of a client terminal which can transmit/receive information through a network is in a communicable state with the network; and information transmission means (ITD (Information Transmission Device)) for transmitting undelivered information to the client terminal, provided that the notification reception means receives the notification.

[0017]

In the information transmission device of the present invention, the information transmission means (ITD)

receives results that a client terminal is in a communicable state, and transmits undelivered information to the client terminal. Thus, the information transmission device does not transmit undelivered information when the client  
5 terminal are not in a communicable state, and therefore it is possible to avoid a situation in which information needs to be continuously transmitted until the client terminal connects to the network. Moreover, since the client terminal does not need to ask for the undelivered information to be  
10 transmitted, the load on the network band is reduced and communication costs reduced.

[0018]

Furthermore, the information transmission device of the present invention in which the information transmission  
15 means (ITD) selects undelivered information to be transmitted to the client terminal from information stored in transmission information storage means, provided that the connection detection means detects the client terminal is in a communicable state with the network, and transmits  
20 the selected undelivered information to the client terminal. Then, for example, if there is undelivered information stored as undelivered services in the transmission information storage means, it is possible to efficiently transmit the  
25 undelivered information when the client terminal connects to the network.

[0019]



Furthermore, the information transmission device of the present invention in which the notification reception means receives transmission-related information required to transmit information to the client terminal; and the information transmission means (ITD) transmits the undelivered information to the client terminal, provided that the notification reception means receives the transmission-related information. Then, for example, if transmission-related information such as an IP address of the client terminal is obtained and the obtained transmission-related information is outputted to the information transmission device, the undelivered information can be transmitted to the client terminal more efficiently.

[0020]

The information transmission method of the present invention includes a connection detection step of detecting, by use of connection detection means, that a client terminal which can transmit/receive information through a network is in a communicable state with the network; and an information transmission step of transmitting, by use of information transmission means, undelivered information to the client terminal, provided that the connection detection means detects the client terminal is in a communicable state with the network.

[0021]

According to the information transmission method of the present invention, the information transmission means receives results that a client terminal is in a communicable state, and transmits undelivered information to the client terminal. Thus, the information transmission device does not transmit undelivered information when the client terminal are not in a communicable state, and therefore it is possible to avoid a situation in which information needs to be continuously transmitted until the client terminal connects to the network. Moreover, since the client terminal does not need to ask for the undelivered information to be transmitted, the load on the network band is reduced and communication costs reduced.

[0022]

Furthermore, the information transmission method of the present invention in which, in the information transmission step, the information transmission means selects undelivered information to be transmitted to the client terminal from information stored in transmission information storage means, provided that the connection detection means detects the client terminal is in a communicable state with the network, and transmits the selected undelivered information to the client terminal. Then, for example, if there is undelivered information stored as undelivered services in the transmission information storage means, it is possible to efficiently transmit the

undelivered information when the client terminal connects to the network.

[0023]

Furthermore, the information transmission method of the present invention in which, in the information transmission step, the information transmission means transmits the selected undelivered information to the client terminal together with other information transmitted to the client terminal. If the other information can be transmitted, the client terminal is in the communicable state with the network. Then, the undelivered information can be transmitted more efficiently since

[0024]

Furthermore, the information transmission method of the present invention in which the other information transmitted to the client terminal is information transmitted/received by use of HTTP, and in the information transmission step, the information transmission means adds the selected undelivered information by changing the HTTP header of the other information transmitted to the client terminal, and transmits the selected undelivered information to the client terminal. Then, the undelivered information can be transmitted to the client terminal together with the other information by so-called a piggyback system. Thus, it is possible to transmit the undelivered information to the client terminal more simply.

[0025]

Furthermore, the information transmission method of the present invention in which, in the information transmission step, the information transmission means transmits the selected undelivered information to the client terminal separately from the other information transmitted to the client terminal. Then, the undelivered information can be transmitted at an appropriate. For example, when a mobile phone as the client terminal is used to make a call, the connection detection means detects the call and enables to transmit mail information as undelivered information to the mobile phone separately from the voice information.

[0026]

Furthermore, the information transmission method of the present invention in which further comprising an information acquiring step of acquiring, by use of the connection detection means, transmission-related information required to transmit information to the client terminal; and an information output step of outputting, by use of the connection detection means, the acquired transmission-related information to the information transmission means. Then, for example, if transmission-related information such as an IP address of the client terminal is obtained and the obtained transmission-related information is outputted to the information transmission device, the undelivered

information can be transmitted to the client terminal more efficiently.

5       The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not to be considered as limiting the present invention.

10       Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this  
15       detailed description.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a view explaining a mail server and a relay device according to an embodiment of the present invention.

20       Fig. 2 is a sequence diagram showing a method for transmitting mail information using the mail server and the relay device of an embodiment of the present invention.

Fig. 3 is a sequence diagram showing a method for transmitting mail information using the mail server and the  
25       relay device of an embodiment of the present invention.

Fig. 4 is a diagram showing a mode of transmitting

information by the replay device of an embodiment of the present invention.

[0027]

DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 Findings of the present invention can be easily understood by considering the following detailed description with reference to the attached drawings, which are shown only for the purpose of illustration. Hereinafter, the preferred embodiments of the present invention will be  
10 described by referring to the attached drawings. Explanations for the corresponding parts in the drawings will not be repeated by applying the same reference numerals, if applicable. If applicable, the same reference numerals will be applied to the corresponding parts in the drawings  
15 and the explanations for these corresponding parts will not be repeated.

[0028]

Description will be made for a mail server and a relay device according to an embodiment of the present invention.  
20 Fig. 1 is a view explaining the mail server and the relay device. The mail server 10 and the relay device 20 constitute parts of a mobile communication network 1. The mobile communication network 1 is constituted to enable the transmission/reception of information between mobile  
25 devices 30 and 60. The mobile communication network 1 is further constituted to enable the transmission/reception

of information between a personal computer 40 and a service provider terminal 50.

[0029]

5       The mobile devices 30 and 60 are mobile phones equipped  
with data communication functions. For the mobile devices  
30 and 60, mobile information terminals such as PDAs  
(Personal Digital Assistants) having communication  
functions are also applicable instead of mobile phones, and  
large variety of other devices for which information  
10       communications are also applicable.

[0030]

15       The personal computer 40 is constituted as a computer  
system which physically comprises a CPU (Central Processing  
Unit), a memory, an input device such as a mouse or keyboard,  
a display unit, a storage device such as a hard disk, a  
communication device such as a modem, etc. In this  
embodiment, the personal computer 40 is used as a terminal  
to transmit a mail to the mobile device 30.

[0031]

20       The service provider terminal 50 is constituted as  
a computer system which physically comprises a CPU (Central  
Processing Unit), a memory, an input device such as a mouse  
or a keyboard, a display unit, a storage device such as a  
hard disk, a communication device such as a modem, etc. In  
25       this embodiment, the service provider terminal 50 is used  
as a terminal to provide services such as information

transmission to users of the mobile devices 30 and 60.

[0032]

5 The mail server 10 comprises a computer system (or a collection of computer systems) which physically comprises a CPU (Central Processing Unit), a memory, an input device such as a mouse or a keyboard, a display unit, a storage device such as a hard disk, etc.

[0033]

10 The mail server 10 includes as functional components an information reception section 101, an information transmission section (information transmission means) 102, a notification reception section (notification reception means) 103, and a transmission information storage section (transmission information storage means) 110. Next, each  
15 component will be described in detail.

[0034]

20 The information reception section 101 receives mail information transmitted to the mobile device which can transmit/receive information through the mobile communication network 1. For example, information reception section 101 receives mail information transmitted from the personal computer 40 to the mobile device 30 through Internet 2. The information reception section 101 outputs the received mail information to the information  
25 transmission section 102, while storing it in the transmission information storage section 110.



[0035]

The information transmission section 102 transmits mail information to the mobile device, that can transmit/receive information through the mobile communication network 1. The information transmission section 102 may transmit the mail information either when it is received from the information reception section 101, or in accordance with the output of detection information received from the notification reception section 103 as described later. When the mail information is transmitted in accordance with the output of the detection information received from the notification reception section 103, the information transmission section 102 reads the mail information stored in the transmission information storage section 110 and transmits it.

[0036]

The notification reception section 103 receives detection information transmitted from relay device 20. The detection information indicates that relay device 20 has detected a mobile device that can transmit/receive information through the mobile communication network 1 is able to communicate with the mobile communication network 1. The notification reception section 103 outputs the received detection information it has received to the information transmission section 102.

[0037]

The transmission information storage section 110 stores mail information transmitted to each of the mobile devices that can transfer information through the mobile communication network 1. The transmission information storage section 110 may store all, mail information received by the information reception section 101, or only the mail information which the information transmission section 102 has tried to transmit but failed. The mail information stored in the transmission information storage section 110 is erased in a predetermined manner. For example, when transmitting mail information to the mobile device 30, this predetermined manner may be when the mobile device 30 returns a message indicating the mail has been received. If such a mail received response is not returned, the corresponding mail information is stored. The stored mail information is transmitted by the information transmission section 102 the next time the mobile device 30 is in communication with the network.

[0038]

The relay device 20 comprises a computer system which physically comprises a CPU (Central Processing Unit), as a memory, an input device such as a mouse or a keyboard, a display unit, a storage device such as a hard disk etc.

[0039]

The relay device 20 includes a connection detection section (connection detection means) 201, a notification

transmission section (notification transmission means) 202,  
an information transmission section (information  
transmission means) 203, and an undelivered information  
storage section (transmission information storage means)  
5 210 as functional components. Next, each component will  
be described in detail.

[0040]

The connection detection section 201 detects that the  
mobile device that can transmit/receive information through  
10 the mobile communication network 1 that is able to in  
communicate with mobile communication network 1. For  
example, the connection detection section 201 detects calls  
from mobile device 30 to mobile device 60, requests from  
mobile device 30 for pull type services (web browsing or  
15 the like) from service provider terminal 50, or the  
allocation of an IP address to the mobile device 30, and  
thus determines that the mobile device 30 is able to  
communicate with mobile communication network 1. The  
connection detection section 201 outputs the detection  
20 result to notification transmission section 202 and  
information transmission section 203.

[0041]

Notification transmission section 202 transmits the  
information obtained from the connection detection section  
25 to mail server 10. More specifically, the notification  
transmission section 202 transmits the detection

information together with information specifying the mobile device that has become communicable with the mobile communication network 1.

[0042]

5           The information transmission section 203 selects information to be transmitted to the mobile device that has become communicable with the mobile communication network 1 from the information stored in the undelivered information storage section 210 in accordance with the detection result  
10 of the connection detection section 201, and transmits the selected information. The undelivered information storage section 210 stores, for example, mail information that mail server 10 has tried to transmit to mobile device 30 but failed, push information transmitted from the service provider  
15 terminal 50 to the mobile device 30 and the like, together with information specifying the mobile device 30 as a recipient. The information stored in the undelivered information storage section 210 is erased in a predetermined manner. For example, when transmitting mail information  
20 to the mobile device 30, this predetermined manner may be when the mobile device 30 returns a message indicating the mail has been received. If such a mail received response is not returned, the corresponding mail information stored. The stored mail information is transmitted by the information  
25 transmission section 203 the next time the mobile device 30 becomes communicable.

[0043]

Next, a method for transmitting mail information by use of the mail server 10 and the relay device 20 will be describes with reference to Fig. 2. A mail sender who intends  
5 to transmit mail to the mobile device 30 transmits mail information from the personal computer 40 (S01). This mail information reaches the mobile communication network 1 through the Internet 2. The main information that has reached the mobile communication network 1 is received by  
10 the information reception section 101 in the mail server 10, and stored in the transmission information storage section 110 (S02). In this description, it is assumed that the information reception section 101 outputs the mail information to information transmission section 102, and  
15 the information transmission section 102 tries but fails to transmit the mail information to mobile device 30.

[0044]

The user of a mobile device 30 requests pull type services from the service provider terminal 50 (S03). When  
20 the mobile device 30 requests the pull type services, that is, by web browsing or the like, the mobile device 30 is set in a communicable state with the mobile communication network 1. The connection detection section 20 in relay device 20 detects this communicable state (S04).

25 [0045]

A result of the detection by the connection detection

section 201 is outputted to notification transmission section 202, and transmitted from notification transmission section 202 to the mail server 10 (S05). The notification receiving section 103 in mail server 10 receives the detection information, and outputs it to the information transmission section 102. Since the detection information specifies the mobile device 30, the information transmission section 102 selects information to be transmitted to mobile device 30 from the information stored in the transmission information storage section 110. The information transmission section 102 transmits the selected information (for example, mail information which has not been transmitted) to mobile device 30 (S06).

[0046]

Next, another method for transmitting mail information by use of the mail server 10 and the relay device 20 will be described with reference to Fig. 3. A mail sender who intends to transmit mail to mobile device 30 transmits mail information from the personal computer 40 (S11). This mail information reaches the mobile communication network 1 through the Internet 2. The mail information that has reached the mobile communication network 1 is received by the information reception section 101 in mail server 10, and outputted to the information transmission section 101. The information transmission section 102 transmits the mail information to the mobile device 30. Here, the information

transmission section 101 determines whether the transmitting of the mail information has been completed (S12). The information transmission section 101 transmits the mail information to the relay device 20 if it determines that the transmission of the mail information has not been received (S13).

[0047]

The mail information transmitted by the information transmission section 101 to the relay device 20 is stored in the undelivered information storage section 210 (S14). The user of mobile device 30 requests pull type services from the service provider terminal 50 (S15). When the mobile device 30 requests the pull type services, that is, by web browsing or the like, the mobile device 30 is set in a communicable state with mobile communication network 1. The connection detection section 201 in relay device 20 detects the setting of this communicable state (S16).

[0048]

Since the detection information specifies mobile device 30, the information transmission section 203 in the relay device 20 selects information to be transmitted to the mobile device 30 from the information stored in the undelivered information storage section 210. The information transmission section 203 transmits the selected information (for example, mail information which has not been transmitted) to mobile device 30 (S17).

[0049]

In the foregoing description, the undelivered mail information or like was transmitted alone by either mail server 10 or relay device 20. However, such information may be transmitted together with other information. Fig. 4 shows a method for transmitting undelivered information together with other information. According to the method of Fig. 4, when mobile device 30 requests pull type services from service provider terminal 50, pull type services (for example, information of web browsing) having an HTTP header are transmitted from service provider terminal 50. The pull type services having the HTTP header are transmitted to relay device 20 in the mobile communication network 1. Relay device 20 changes the HTTP header received into the HTTP header containing undelivered information, adds the undelivered information to the pull type services, and then transmits the services to mobile device 30.

[0050]

According to the embodiment, since the connection detection section 201 detects mobile device 30 has been set in the communicable state, and information transmission section 102 in mail server 10 or information transmission section 203 in relay device 20 transmits undelivered information such as mail information to mobile device 30 in accordance with the detection, no mail information is transmitted when mobile communication network 1 and the



mobile device 30 are not in a communicable state with each other. Thus, it is possible to avoid the situation in which information needs to be continuously transmitted to mobile communication network 1 until the mobile device 30 connects to mobile communication network 1. Moreover, a client terminal does not need to request that the undelivered information to be transmitted, and the load on the network band is reduced.

[0051]

When connection detection section 201 detects connection, information transmission section 102 or the information transmission section 203 selects mail information to be transmitted to mobile device 30 from the undelivered information stored in transmission information storage section 110 in mail server 10 or undelivered information storage section 210 in relay device 20 and transmits the selected information. Thus, it is possible to efficiently transmit mail information when mobile device 30 connects to mobile communication network 1.

[0052]

If information transmission section 203 transmits undelivered information together with other information to be transmitted to mobile device 30, undelivered information can be transmitted more efficiently since mobile device 30 is in the communicable state with mobile communication network 1. Especially, if the undelivered information is

added to information transmitted/received by use of HTTP  
by changing the HTTP header, and transmitted to the mobile  
device 30, the non-transmitted information can be  
transmitted to the mobile device 30 by a so-called piggyback  
5 system. Thus, the undelivered information can be  
transmitted to mobile device 30 more easily. On the other  
hand, if the undelivered information is transmitted  
separately from the other information to be transmitted to  
mobile device 30, it is possible to transmit the undelivered  
10 information at an appropriate time.

[0053]

Furthermore, if connection detection section 201  
acquires information required to transmit information to  
mobile device 30, and outputs that information to information  
15 transmission section 102 or information transmission  
section 203, the undelivered information can be transmitted  
to mobile device 30 more efficiently.

[0054]

According to the present invention, client terminals  
20 are detected when they are in the communicable state, and  
the undelivered information is transmitted to the client  
terminal in accordance with the detection, the undelivered  
information is not transmitted when the client terminal are  
not set in a communicable state. Thus, it is possible to  
25 avoid a situation where information needs to be continuously  
transmitted until the client terminal connects to the network.

Moreover, since the client terminal does not need to request that the undelivered information be transmitted, the load on the network band is reduced and communication costs reduction is achieved. Therefore, it is possible to satisfy the objects of the present invention, that is, it is possible to provide the relay device, the information transmission device, and the information transmission method which can enable push-type services suited to the network as well as the network user.

From the invention thus described, it will be obvious that the embodiments of the invention may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended for inclusion within the scope of the following claims.